

# Variable Capacitor Using MOS Gated Diode with Multiple Segments to Limit DC Current

## Abstract

A voltage-variable capacitor uses the channel-to-substrate junction from a gated diode formed from a metal-oxide-semiconductor transistor. The transistor gate has at least two contacts that are biased to different voltages. The gate acts as a resistor with current flowing from an upper gate contact to a lower gate contact. The gate-to-source voltage varies as a function of the position. A critical voltage is where the gate-to-source voltage is equal to the transistor threshold. A portion of the gate that has gate voltages above the critical voltage has an inversion layer or conducting channel under the gate. Another portion of the gate has gate voltages below the critical voltage, and thus no channel forms. By varying either the gate voltages or the source voltage, the area of the gate that has a channel under it is varied, varying the channel-to-substrate capacitance. Separate gate arms reduce bias current.